INTEGRATION OF INTERNET OF THINGS TECHNOLOGIES INTO ONBOARD COMPUTERS

Dyuzhaev L. P., PhD., associate professor, Maksymets D. V, Master student
Igor Sikorsky Kyiv Polytechnic Institute, Kyiv, Ukraine

Internet of Things (IoT) is a internetworking of physical devices, vehicles, buildings, and other items — embedded with electronics, software, sensors, actuators, and network connectivity that enables these objects to collect and exchange data [1].

IoT branch has various applications: aviation, mass transit, maritime, rail, roadways, vehicles and cars. Use IoT technology in cars related to automation the collaboration between car and driver.

One of the applications in car industry is to reduce the time and expense of managing vehicle connectivity with Control Center. Prevent data overages and ensure predictable billing with automated controls that monitor and manage connectivity throughout vehicle lifecycle [2].

As a part of connected devices onboard computer will sent following data to Control Center:

– Vehicle location and speed. From repeated reports you can get direction and path;
– Voltage, oil status;
– Temperature inside and outside;
– Climate control settings;
– Error information.

For connecting onboard computer to Control Center GSM module should be build in into the car onboard system. GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer. GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network [3]. There are lots of GMS modules available in the market now. One of the most widely used is SIMCOM SIM7700V, SIM7500SA etc.

Simcom SIM7700V

SIM7700V is based on Sequans SQN3223 single-mode LTE category 1 platform. SIM7700V is a complete LTE category 1 module design with very powerful processors integrating application core and two MIPS24KEc processors (up to

368.64 MHz), allowing customers to benefit from small dimensions and cost-effective product s solutions.

It has strong extension capability with rich interfaces including UART, USB 2.0 , SPI, PCM and etc. With abundant applications capability like IPV4&V6 Multi-PDP/HTTP/HTTPs/DNS/SMS and DTMF, the module provides much flexibility and ease of integration for customers' applications [4].

General features [4]:

- Dual-Band LTE-FDD Category 1 B4/B13;
- Control Via AT Commands ;
- Supply voltage range: 3.4 – 4.4 V;
- Operating temperature: −30 – 60 °C
- Storage temperature: −40 – 85 °C;
- Humidity: 10 – 85%;
- Dimension: 21.35 × 20.25 × 1.48 mm;
- Weight: 1.5 g;
- LTE-FDD/Rel-10 Category 1;
- Packaging form: 108 PADs LGA;
- RoHS compliant & Halogen-free.

Simcom SIM7500SA

The SIM7500SA is Multi-Band LTE-FDD/HSPA module solution in a LGA type which supports LTE CAT1 up to 10 Mbps for downlink data transfer. It has strong extension capability with rich interfaces including UART, USB 2.0, I2C, GPIO etc. With abundant application capability like TCP/UDP/FTP/FTPS/HTTP/HTTPS/SMTP/POP3 and MMS [5].

General features [5]:

- FDD-LTE B1/B3/B5/B7/B8/B28;
- Dual-Band WCDMA/HSDPA/HSPA+ B1/B5;
- Control Via AT Commands;
- Supply voltage range: 3.4 – 4.2V;
- Operation temperature: −40 – 85 °C;
- Dimension: 24 × 27 × 2.75mm;
- Weight: 4.0 g.

Both SIM7700V and SIM7500SA support following interfaces:

- USB2.0;
- UART;
- SIM card;
- I2C;
- GPIO;
- ADC;
- PCM.

Whether it's a fleet of city buses, motor coaches, taxis, ambulances, police

cars, long-haul delivery trucks, or light commercial vehicles, all this vehicles require this technology in following applications [6]:

– Telematics for proactive fleet maintenance and efficient fuel management, to keep more vehicles in service;

– Real-time vehicle monitoring and data transmission for faster response and delivery;

– GPS tracking to provide safety, more efficient navigation, and increased productivity;

– An increasing need for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication;

– Management of drivers and schedules to comply with regulations and provide greater safety and efficiency.

References

1. Internet of Things ***[e-source]*** — Access mode: https://en.wikipedia.org/wiki/ /Internet_of_things/ Internet Of Things — Title screen.

2. Control Center for connected cars ***[e-source]*** — Access mode: https://www.jasper.com/control-center-for-connected-cars Control Center for connected cars — Title screen.

3. What is GSM module ***[e-source]*** — Access mode: https://www.engineersgarage.com/what-is-gsm-gprs-module GSM module — Title screen.

4. SIM7700V ***[e-source]*** — Access mode: http://simcomm2m.com/ /En/module/detail.aspx?id=165 SIM7700V — Title screen.

5. SIM7500SA ***[e-source]*** — Access mode: http://simcomm2m.com/ /En/module/detail.aspx?id=163 SIM7500SA — Title screen.

6. Commercial vehicles ***[e-source]*** — Access mode: http://www.cisco.com/c/en/us/ /solutions/industries/transportation/commercial-vehicles.html Commercial vehicles — Title screen.

Анотація

Представлено короткий огляд використання автомобіля як частини системи Інтернету речей. Розглянуто особливості GSM модулів.

Ключові слова: Інтернет речей, бортовий комп’ютер.

Аннотация

Представлены краткий обзор использования автомобиля как части системы Интернета вещей. Рассмотрены особенности GSM модулей.

Ключевые слова: Интернет вещей, бортовой компьютер.

Abstract

A brief review using onboard computer of car in system of Inter of Things. GSM modules features are described.

Keywords: Internet of Things, onboard computer.